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FOLEY & LARDNER
3000 K Street, N.W.
Suite 500
Washington, DC 20007-8696

EXAMINER
SORKIN, DAVID L

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Paper No. 504

Application Number: 09/274,014
Filing Date: March 22, 1999
Appellant(s): VOUTE ET AL.

Stephen A. Bent
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 12 March 2004.

(1)   Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2)   Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly

affect or be directly affected by or have a bearing on the decision in the pending appeal

is contained in the brief.

(3)   Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4)   Status of Amendments After Final

No amendment after final has been filed. Though the after final communication

filed 06 June 2003 is titled "AMENDMENT AND REQUEST FOR

RECONSIDERATION", no amendment is contained therein. Though the after final

communication filed 01 April 2003 is titled "AMENDMENT AND REQUEST FOR

RECONSIDERATION" and purports to include a proposed amendment to claims 1 and

6, and includes text corresponding to claims 1 and 6, the claims in fact are not

amended, but identical to the finally rejected claims.

(5)   Summary of Invention

The summary of invention contained in the brief is substantially correct. The

examiner only wishes to point out that on page 9, line 27 (and in several other portions)

of the specification, it is stated that percent pore volume being less than "about 30%" is

an aspect of the invention (emphasis added).

(6)   Issues

The appellant's statement of the issues in the brief is correct.

(7)   Grouping of Claims

Appellant's brief includes a statement the claims do not stand or fall together and

provides reasons as set forth in 37 CFR 1.192(c)(7) and (c)(8). Appellant separately

argues three subsets of claims by providing additional reasons for patentability, these

subsets are designated Group 2: claims 11 and 12; Group 3: claims 7,8 and 60; and

Group 4: claims 2, 3, 6 and 59-63.

(8)   Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9)   Prior Art of Record

5,445,732	Girot et al.	8-1995
4,203,772	Davis, Jr. et al.	05-1980

(10) Grounds of Rejection

The following grounds of rejection are applicable to the appealed claims:

Claims 1-22 and 59-63 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Girot et al. (US 5,445,732), and in the alternative over Girot et al. (US 5,445,732) in

view of Davis, Jr. et al. (US 4,203,772). Regarding **claim 1**, Girot ('732) discloses

dense mineral oxide supports comprising a mineral oxide matrix (see col. 5, lines 40-62)

having an external surface and pores (see col. 5, lines 3-5); and an interactive polymer

network which fills the pores and is coated on the surface of the mineral oxide matrix

(see col. 5, lines 3-15 and 40-62; col. 15, lines 38 and 39, col. 17, lines 31-34), so that

subsequent interaction with macromolecules occurs on the external surface of the

support (see col. 5, lines 25-39 and col. 6, lines 31-35). Girot ('732) does not explicitly

disclose the porosity being "less than 30% of the total volume of the mineral oxide

matrix" as claimed. However, Girot ('732) recognizes that a broad range of porosities

are suitable for the invention (see "about 0.2 to about 2 cm^3/gram"; col. 8, lines 40-45;

col. 15, lines 45-55; col. 36, lines 12-15). As held in *In re Aller,* 220 105 USPQ 233, 235

(CCPA 1955), "where the general conditions of a claim are disclosed in the prior art, it is

not inventive to discover the optimum or workable ranges by routine experimentation."

Therefore, it is considered that the claimed support is unpatentable as it differs from

support of Girot ('732) only in that an optimal or workable range of the porosity has been

discovered. Although the court referred not only to the "optimum" range, but also the

"workable" range, one of ordinary skill in the art would be motivated to have minimized

the porosity because Girot ('732) states that "it is generally desirable to have as great a

density difference as possible between the solid support particles and the fluidizing

medium" (col. 2, lines 8-11), and "fluidization of dense particles in aqueous suspension

is possible at high flow rates that, in turn, are very desirable when dealing with large

scale applications" (col. 2, lines 17-19). Of course, as would be understood by one of

ordinary skill in the art, minimizing porosity (percent empty space) maximizes density.

In the alternative, the claim is considered unpatentable over Girot ('732) in view of Davis

('772). Davis ('772) explicitly discloses mineral oxide matrixes having porosities less

than 30% (see Tables II and III). It is considered that it would have been obvious to one

of ordinary skill in the art to have employed the matrix material of Davis ('772) for the

matrix of Girot ('732) because Girot ('732) emphasizes that "[a] wide variety of non-

passivated porous solids matrices are amenable to passivation by the general method

of the present invention" (col. 5, lines 40-42)". Furthermore, Girot ('732) goes on to

specifically suggest "mineral oxide" matrices including oxides of "zirconium" (see col. 5,

lines 42-62), providing strong motivation look toward the teachings of Davis ('772),

which concern zirconium oxide matrices. Regarding **claims 2, 3 and 59**, it is

considered that the density would intrinsically be in the claimed ranges of 1.7-11 and

2.1-10 if the porosity is less than <30%, because zirconium oxide (which both

references disclose) has a density of 5.6 (see CRC Handbook of Chemistry and Physic,

59th edition, page B-184). Regarding **claims 4 and 5**, Girot ('732) discloses particle

sizes within the claimed ranges of 5-500 microns and 10-100 microns (see col. 8, lines

47-53). Regarding **claim 6**, Girot ('732) discloses a dense mineral oxide supports

comprising a mineral oxide matrix having an external surface and pores; and an

interactive polymer network which fills the pores and is coated on the surface of the

mineral oxide matrix (see col. 5, lines 3-15 and 40-62; col. 15, lines 38 and 39), so that

subsequent interaction with macromolecules occurs on the external surface of the

support (see col. 5, lines 25-39 and col. 6, lines 31-35). Girot ('732) further discloses a

particle size within the range 10-100 microns (see col. 8, lines 47-53). Girot ('732) does

not explicitly disclose the porosity being "less than 30% of the total volume of the

mineral oxide matrix" as claimed. However, Girot ('732) recognizes that a broad range

of porosities are suitable for the invention (see col. 8, lines 40-45; col. 15, lines 45-55;

col. 36, lines 12-15). As held in *In re Aller*, 220 105 USPQ 233, 235 (CCPA 1955),

"where the general conditions of a claim are disclosed in the prior art, it is not inventive

to discover the optimum or workable ranges by routine experimentation." Therefore, it

is considered that the claimed support is unpatentable as it differs from support of Girot

('732) only in that an optimal or workable range of the porosity has been discovered.

Although the court referred not only to the "optimum" range, but also the "workable"

range, one of ordinary skill in the art would be motivated to have minimized the porosity

because Girot ('732) states that "it is generally desirable to have as great a density

difference as possible between the solid support particles and the fluidizing medium"

(col. 2, lines 8-11), and "fluidization of dense particles in aqueous suspension is

possible at high flow rates that, in turn, are very desirable when dealing with large scale

applications" (col. 2, lines 17-19). Of course, as would be understood by one of

ordinary skill in the art, minimizing porosity (percent empty space) maximizes density.

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than 30% (see Tables II and III). It is considered that it would have been obvious to one

of ordinary skill in the art to have employed the matrix material of Davis ('772) for the

matrix of Girot ('732) because Girot ('732) emphasizes that "[a] wide variety of non-

passivated porous solids matrices are amenable to passivation by the general method

of the present invention" (col. 5, lines 40-42)". Furthermore, Girot ('732) goes on to

specifically suggest "mineral oxide" matrices including oxides of "zirconium" (see col. 5,

lines 42-62), providing strong motivation look toward the teachings of Davis ('772),

which concern zirconium oxide matrices. It is considered that the density would

intrinsically be in the claimed ranges of 1.7-11 and 2.1-10 if the porosity is less than

<30%, because zirconium oxide (which both references disclose) has a density of 5.6

(see CRC Handbook of Chemistry and Physic, 59th edition, page B-184). Also, the

discussion of Girot ('732) of the advantages of high density were discussed above.

Regarding **claims 7, 8 and 60**, it is considered not inventive to have discovered

optimum or workable ranges of porosity as discussed above. Davis ('772) discloses

specific porosity values (7.9%, 18.8% etc.) which are within each claimed range (see

Tables II and III). Regarding **claim 9 and 61**, zirconia is disclosed by both references

(see Girot '732, col. 5, lines 58-62 and Davis '772, title). Regarding claims **10 and 62**,

the interactive polymer network comprises a soluble organic polymer crosslinked in

place (see col. 15, lines 17-20). Regarding **claims 11 and 12**, polysaccharides,

including dextran, are disclosed by Girot ('732) (see col. 16, line 59). Regarding **claims

13 and 15-22**, the monomer may be vinylpyrrolidone (see col. 18, line 27), thereby

satisfying the each of claims 13 and 15-22. Regarding **claims 14 and 63**, the polymer

network comprises monomers copolymerized in place with the mineral oxide matrix (col.

15, lines 17-20).

(11) Response to Argument

Initially, it must be pointed out that the brief includes a material

scientific/mathematical error in its analysis of Girot ('732). Appellant appears to make

the error against appellant's own interest, as the correct calculations are more favorable

to appellant's argument. The error originates in the mathematics, assumptions and

reasoning of the first full paragraph of page 12, but is relied upon throughout the

arguments of the brief. Putting aside for the moment the issue that appellant has

selected the narrowest porosity range of Girot ('732), 0.8 to 1.2 cm^3/gram, ignoring the

broader range of 0.2 to 2.0 cm^3/gram, the flawed analysis of page 12 must first be

addressed. Appellant claims percent pore volume (porosity), while, in the above quoted

ranges, Girot ('732) discloses porosity in units of volume/mass, particularly cm^3/gram.

Porosity in cm^3/gram units cannot be converted to percent pore volume without knowing

the intrinsic density (density with no pores) of the material in question. Appellant takes

the example of the material being silica (silicon dioxide), but incorrectly calculates

percent porosity from the range 0.8 to 1.2 cm^3/gram. The term "silica" does not

correspond precisely to an intrinsic density because various atomic arrangements exist

with somewhat different densities. The intrinsic density of silica therefore ranges from

about 2.1 to about 2.6 grams/cm^3 (see CRC Handbook of Chemistry and Physic, 59th

edition, page B-161). Appellant's statement "porous silica has a volume/weight ratio of

2, *i.e.*, 2 ml or 2 cm^3 of beads yield about 1 gram of material" is completely irrelevant to

the conversion (of 0.8 to 1.2 cm^3/gram to a percent porosity range). This is because the

statement *assumes* a particular porosity. The statement that porous silica has a

particular volume/weight ratio completely contracts the concept of a range of porosities.

The relevant physical constant needed to make the conversion appellant desires is the

intrinsic density of silica. Let us take the example of silica having an intrinsic density of

2.19 grams/cm^3 (the density of amorphous silica). This corresponds to a volume/weight

ratio of 0.457 cm³/gram, in stark contrast to the value of 2 cm³/gram mentioned by

appellant. Now, let us attempt to convent the range 0.8 to 1.2 cm³/gram properly:

Conversion of 0.8 cm³/gram:

One gram has 0.8 cm³ of voids. One gram has 0.457 cm³ of solid. The total

volume of one gram is 0.8 + 0.457 = 1.257 cm³. The porosity is 0.8/1.257 or 64%.

Conversion of 1.2 cm³/gram:

One gram has 1.2 cm³ of voids. One gram has 0.457 cm³ of solid. The total

volume of one gram is 1.2 + 0.457 = 1.657 cm³. The porosity is 1.2/1.657 or 72%.

In summary, appellant has miscalculated that porous volume of 0.8 to 1.2

cm³/gram corresponds to 40% to 60% porosity for silica. Actually it corresponds to

about 64% to 72%.

Based upon the above, the examiner agrees that the narrow range 0.8 to 1.2

cm³/gram does not correspond to less than 30% porosity. However, Girot ('732)

discloses a broader range "about 0.2 to about 2 cm³/gram" (see col. 8, line 44; col. 15,

line 51; col. 36, line 14) and states that silica in this range is "most preferred" (col. 15,

line 48). Thusly, appellant has ignored what Girot ('732) has characterized as most

preferred. Furthermore, Girot ('732) is not limited to this "most preferred" range of 0.2 to

2 cm³/gram. As done above for other values, let us convert the value 0.2 cm³/gram to a

percent porosity:

Conversion of 0.2 cm^3/g:

One gram has 0.2 cm^3 of voids. One gram has 0.457 cm^3 of solid. The total

volume is 0.2 + 0.457 cm^3 = 0.657 cm^3. The porosity is 0.2/0.657 or 30%.

As seen above, **about 0.2 cm^3/g** silica corresponds to **about 30%** porosity.

Compare this instant situation to *In re Woodruff* 16 USPQ2d (Fed. Cir. 1990) where the

court held that where the prior art taught about 1-5% carbon monoxide concentration,

and the claim was limited to "more than 5%", the claimed invention was obvious over

the prior art.

Appellant argues on page 14 of the brief that:

> Such and extension, beyond the range disclosed in Girot ('732), would
> directly contravene the ability to have biomolecules diffuse into the pores. A
> porosity of less than 30% as presently claimed is therefore not a "workable"
> range when considered in light of the purpose of Girot ('732).

This argument is unconvincing for at least the two following reasons:

a. Most claims of Girot ('732) are not limit to a particular porosity.

b. A percent porosity of less than 30% would not prevent biomolecules from

entering the pores. The *size* of individual pores determines whether or not

biomolecules may enter, not the percent porosity. There may be many extremely small

pores yielding a high percent porosity while preventing entry of biomolecules, or there

may be few large pores yielding a low percent porosity while allowing entry of

biomolecules. Far from being a just a hypothetical possibility as applicant alleges, in the manner in which porous metal oxide beads are made in the art by high temperature firing, decreasing percent porosity actually *increases* the size of the individual pores (see col. 13 lines 25-42 of Carr et al. US 5,015,373, which was discussed in paper No. 22). This is possible because the number of pores simultaneously decreases.

In the sentence bridging pages 14 and 15 of the brief appellant quotes a portion of Girot ('732) which refers to "gel porosity"; however, it is critical to keep in mind "gel porosity" is the porosity of the gel which fills pores of the mineral oxide matrix, not the porosity of the mineral oxide support itself.

Appellant alleges on pages 15-16 of the brief that the matrix of Davis ('772) would not be suitable for the invention of Girot ('732); however appellant offers no evidence or reasoning to support this.

Unpatentability of claims 11 and 12

On page 16 of the brief appellant sates "...claim 12 more particularly recites ... dextran...These polymers are quite different than those in Girot ('732)". However, Girot ('732) explicitly recites "polysaccarides such as dextran" in col. 16, line 59.

Unpatentability of claims 7, 8, and 60

These claims include narrower percent porosity ranges. However, the invention of Girot ('732) is not limited to a particular porosity range and Girot ('732) provides motivation for one of ordinary skill in the art to minimize porosity, as explained above. Furthermore, Davis ('772) discloses specific examples of metal oxide matrixes having porosities in each of the claimed ranges.
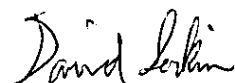
Unpatentability of claims 2, 3, 6, 60-63

Zirconium oxide (disclosed in col. 15, lines 47-48 of Girot '732 and disclosed in the title of and throughout Davis '772) has an intrinsic density (density a zero porosity) of 5.6 (see CRC Handbook of Chemistry and Physic, 59th edition, page B-184). The density ranges of these claims are therefore necessarily satisfied (in the instance of the oxide being zirconium oxide) if the other limitations of the claims (being less than 30% porosity), are satisfied.

For the above reasons, it is believed that the rejections should be sustained.
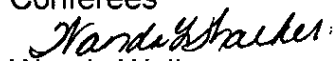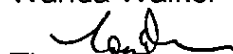
Respectfully submitted,

David L. Sorkin
Examiner
Art Unit 1723

David Sorkin

May 14, 2004

Conferees

Wanda Walker

Thomas Dunn

PENNIE & EDMONDS
1667 K STREET N W
WASHINGTON, DC 20006